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SHUTTLE CRITICAL ITEMS LIST - ORBITER

SUBSYSTEM : ATMOSPHERIC REVIT. FMEA NO 06-18 -0547 -3 REV: 09/07/

:WATER FUMP ASSEMBLY P/N RI

:MC621-0008-0455/56

P/N VENDOR: SV729708-4 HAM STD

C: YTITHAUO

:LOOP 1 - 2 PUMPS

EFFECTIVITY: PHASE(5): PL

VEHICLE

CRIT. HEV: 102 103 104

LOX -- X DOX LS

CRIT. FUNC:

:LOOP 2 - 1 PUMP

PREPARED BY:

DES N. K. DUONG

N. L. STEISSLINGER REL ON DE Warmen / Lui

D. STOICA

REDUNDANCE SCHEEK: Flild. APPROVING BY & Orkote

A-PASS B-PASS C-FA APPROVED BY THISA) :

REL (3

LASTOF QE

ITEM:

PUMP, WATER COCLANT

FUNCTION:

PROVIDES THE MOVING FORCE FOR WATER CIRCULATION IN THE WATER COCTANT LOOPS. LOOP ONE CONTAINS TWO PUMPS AND LOOP 2 CONTAINS ONE FUMP.

FAILURE MODE:

EXTERNAL LEAKAGE

CAUSE(5):

MECHANICAL SHOCK, VIBRATION, CORROSION, SEAL MATERIAL DEGRADATION.

EFFECT(S) ON:

(λ) SUBSYSTEM (Β) INTERFACES (C) MISSION (D) CREW/VEHICLE

IC-DES

- (A) LOSS OF REDUNDANCY LOSS OF ONE WATER COCLANT LOOP.
- (B) LOSS OF COOLING OF AFFECTED WATER COOLANT LOOP. FREE WATER IN CAST
- (C) POSSIBLE EARLY MISSION TERMINATION FOR LOSS OF ONE WATER COCLANT LOOP.
- (D) POTENTIAL LOSS OF CREW/VEHICLE UPON SUBSEQUENT LOSS OF REDUNDANT WATER COOLANT LOOP.

DISPOSITION & RATIONALE:

(A) DESIGN (B) TEST (C) INSPECTION (D) FAILURE HISTORY (E) OPERATIONAL USE

(A) DESIGN

THE PUMP IS A CENTRIFUGAL 2 STAGE TYPE DRIVEN BY A CANNED TYPE INDUCTIC MOTOR OPERATING ON 115 VAC, 400HZ, 3 PHASE POWER SUPPLY. THE PUMP PACKAGE HAS AN INLET FILTER (10/25 MICRON) AND THE PUMP HAS 61 MICRON INLET AND OUTLET FILTERS TO CONTROL CONTAMINATION. THE ARMATURE AND PU IMPELLERS ARE SUPPORTED BY TWO CARBON SLEEVED BEARINGS WHICH ARE LUBRICATED BY A HYDRODYNAMIC LAYER OF WATER FLOWING THROUGH THE PUMP. FLUID ENTERS THE PUMP INLET VIA TWO STAGE IMPELLERS AND FLOWS BETWEEN MOTOR AND PUMP HOUSING CAVITY TO EXIT TUBE. PUMP IS MADE OF STAINLES! STEEL EXCEPT FOR BEARINGS AND WEAR FITTINGS WHICH ARE CARBON. ALL SE ARE TEFLON. VITON O-RINGS ARE USED TO SEAL THE CONNECTIONS WHERE THE

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PUMP IS MATED TO THE INLET AND OUTLET MANIFOLDS OF THE PUMP PACKAGE. A MATERIALS ARE CORROSION RESISTANT AND COMPATIBLE WITH WATER.

(B) TEST

ACCEPTANCE TEST - PROOF PRESSURE AT 136-139 PSIG FOR GREATER THAN MINUTES. LEAKAGE RATE OF MORE THAN 0.005 CC/HR H20 MAXIMUM AT 91 +/- PSID.

QUALIFICATION TEST - PROOF PRESSURE AT 136-139 PSIG FOR MINIMUM 5 MINUTE BURST PRESSURE OF 180 PSIG. SUBJECTED TO RANDOM VIBRATION SPECTF ENVELOPE OF 20 TO 150 HZ INCREASING AT 6 DB/OCTAVE TO 0.03 G**2/FC CONSTANT AT 0.03 G**2/HZ FROM 150 TO 1000 HZ, DECREASING AT 6 DB/OCTAFROM 1000 TO 2000 HZ FOR 48 MINUTES PER AXIS IN THREE ORTHOGONAL AXED DESIGN SHOCK - THREE TERMINAL SAWTOOTH PULSES OF 20 G PEAK AMPLITUDE A 11 MS DURATION APPLIED IN BOTH DIRECTIONS ALONG EACH OF THREE ORTHOGON AXES.

IN-VEHICLE TESTING - SYSTEM DECAY TEST IS PERFORMED AT 85 - 95 PSIG, CC/MIN MAX LEAKAGE. PUMP OUT PRESSURE AND ACCUMULATOR QUANTITY > CONTINUOUSLY MONITORED WHEN THE VEHICLE IS POWERED UP AND SERVE AS INDICATION OF EXTERNAL LEAKAGE.

OMRSD - PUMP ACCUMULATOR QUANTITY AND OUTLET PRESSURE ARE CONTINUOUS MONITORED WHILE THE VEHICLE IS POWERED UP DURING EACH TURNAROUND, SERVE AS AN INDICATION OF EXTERNAL LEAKAGE. WATER IS SAMPLED PER 51 0073 DURING SERVICING.

(C) INSPECTION

RECEIVING INSPECTION

INCOMING PARTS ARE VERIFIED FOR MATERIAL, PHYSICAL PROPERTIES AND PROCE CERTIFICATION.

CONTAMINATION CONTROL

CLEANLINESS IS MAINTAINED AND VERIFIED TO REQUIRED LEVEL. INSPECTIVERIFIES CORROSION PROTECTION PROVISIONS.

ASSEMBLY/INSTALLATION

DIMENSIONS AND SURFACE FINISHES VERIFIED BY INSPECTION. ORIENTATION CONNECTOR MASTER KEYWAY IS DETERMINED AND VERIFIED BY INSPECTION HOUNTING FEET COATED FOR ELECTRICAL BONDING PURPOSE IS VERIFIED.

NONDESTRUCTIVE EVALUATION

LEAK CHECK IS VERIFIED BY INSPECTION.

CRITICAL PROCESSES

WELD OF THE FILTER HOUSING TO PUMP INLET FLANGES IS VERIFIED. TUBE WELL ARE VERIFIED BY INSPECTION. ADHESIVE BONDING OF FILTER IS CHECKED.

TESTING

ATP IS VERIFIED BY INSPECTION.

HANDLING/PACKAGING

ALL PACKAGING FOR SHIPMENT IS VERIFIED BY INSPECTION.

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(D) FAILURE HISTORY
THREE FAILURES HAVE OCCURRED:

ACOGS1-010, 7/28/81 AT THE SUPPLIER. EXTERNAL LEAKAGE WAS 1800 SCT: SHOULD BE 2.5 SCCH MAX. LEAK WAS AT THE HIGH PRESSURE FITTING ON TO DELTA P TRANSDUCER DUE TO MISALIGNMENT CAUSED BY TOLERANCE BUILDU CORRECTIVE ACTION - FUTURE UNITS UTILIZED A NEW FRAME WHICH ELIMINAT THE VARIATIONS CAUSED BY SHEET METAL TOLERANCE. TUBE INSTALLATION PROCEDURES WERE REVISED TO VERIFY ALIGNMENT PRIOR TO INSTALLATION.

ACS361-010, 3/16/83 IN ATP AT THE SUPPLIER. A FLARED TUBE FITTING LEAK HELIUM AT 7.9 X 10 EXP -4 SCCS; SHOULD BE 5.3 X 10 EXP -4 SCCS MA LEAKAGE WAS AT PUMP OUTLET LINE TO DELTA F TRANSDUCER AND WAS CAUSED TOLERANCE BUILDUP. CORRECTIVE ACTION - A STRESS RELIEVING (ANNEALIN OPERATION WAS ADDED TO THE MANUFACTURING PROCESS SHEETS TO MAKE THE TU OF UNIFORM HARDNESS THROUGHOUT ITS LENGTH TO FACILITATE REFORMING, REQUIRED, AT ASSEMBLY.

AC6938-010, 10/25/83 AT THE SUPPLIER. EXTERNAL LEAKAGE WAS 1.8 X 10 E -3 SCCS GHE AT FLARED TUBE THAT CONNECTS THE DELTA P TRANSDUCER INTO THE HIGH PRESSURE SIDE OF THE PUMP. THE FITTING WAS FOUND TO UNDERTORQUED - 100 IN-LB VS 140 IN-LB REQUIRED. CORRECTIVE ACTIC ASSEMBLY AND IN-PROCESS TESTING WERE REVISED TO ADD A PROOF AND LEAK TO PRIOR TO ASSEMBLY OF THE ACCUMULATOR ON THE PUMP PACKAGE SO THAT COUPLING NUTS ARE ACCESSIBLE FOR LEAK TESTING AND RETOROUING.

(E) OPERATIONAL USE TBS.